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teaching facilities through its finely equipped lecture and demonstration rooms and laboratories, as contrasted with the Bellevue that grudgingly gave six wards for the practice field of the school Miss Schuyler sought to establish and that protested against the placing of nurses in the maternity wards and operating room.⁵

A significant incident in this connection is the fact that on the day Miss Schuyler received her degree from Columbia, less than fifty years after her initiation of the Bellevue Training School, degrees were conferred by Columbia University upon twelve nurses, graduates of the Teachers College who were to go out as teachers and administrators in schools of nursing and to supervisory positions in the public health field, thus fulfilling in a wider way than ever Miss Schuyler perhaps dreamed of, the underlying purpose of her plan—the provision for the most needy members of the community, when ill, of the most efficient and scientific care.

ASEPTIC FEVER NURSING

By D. L. RICHARDSON, M.D.

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Nursing of the sick is of ancient origin. In past centuries it has been performed by women with the highest motives, for the most part, but with crudest knowledge of disease. There was no real training and, if there had been, little could have been expected of such women when the exact knowledge of disease was so much more philosophical than scientific. It is not pleasant to realize that the earliest professional nurses were neither moral nor efficient, that nursing was looked upon as a disgraceful calling, and that women of character refrained from undertaking it. The results achieved by a few high-minded women during the Crimean War were, it may be truly said, the origin of modern nursing. Since that time, it has been put upon the highest moral and scientific basis. Within recent years, indeed, nursing knowledge and nursing methods have so far developed that it is no longer sufficient that a woman be known as a nurse, but it is asked of her in what kind of nursing she is most proficient. This specialization has followed much the same course as has been observed in the specialization of medicine, though there will always remain the general nurse, just as always the general practitioner.

The object of this paper is to point out a new field of nursing; namely, the care of infectious diseases, long known in England as "fever nursing."

⁵ *Recollections of a Happy Life*, pp. 91, 103.

Many nurses avoid as far as possible the care of such cases, and for two reasons; they realize their insufficient training and fear the possible consequences. Both these obstacles can be removed by a thorough training in fever nursing which embraces a knowledge of the nature of infectious diseases, their modes of transmission and methods for their prevention. The subject will be treated chiefly from the standpoint of hospital care, yet the same principles apply to the treatment of infectious disease in the home. Fever nursing aims, fundamentally, at these two objects: the intelligent care of the patient in order that he may recover, and the protection of the nurse and other patients in the institution from contracting the disease from which the patient suffers. The following article will be restricted to a consideration of methods applying to the second of these principles, the prevention or diminution of disease-transmission.

Modes of transmission of the so-called "contagious diseases" have been made much clearer during the last fifteen years; what has been a "beating in the air" process to control them is being put on a scientific basis. The first long step was taken when it became evident that the importance of "air infection" had been greatly over-rated. This theory, which arose after the discovery of disease-producing germs, must be torn down before we can control infection intelligently. The arguments against aerial conveyance of infection are practical results obtained in institutions which treat infectious diseases.

In 1888, Grancher of Paris, a visiting man to the Hospital for Sick Children, conceived the idea that infectious diseases were not carried by air but by contact and that infection might be controlled by the same method that surgeons were using, "antisepsis." Into his wards, a general hospital for children, cases of diphtheria, scarlet fever, and measles were frequently admitted. From 1890 to 1900 he carried out the following technique: patients admitted with the above diseases were placed in wards with other patients but the bed of each infectious patient was surrounded by a wire screen. This screen served two purposes: it kept the patient away from other patients and it reminded nurses and physicians that special precautions must be observed when treating that patient. Within the enclosure were kept the patients' own utensils, gowns for the doctor and nurses, and solutions with which the hands must be washed after treating the patient. During this period of ten years, 6541 patients were treated in Grancher's wards. Forty-three cases of diphtheria were admitted and only one of the other patients contracted the disease. Scarlet fever was introduced nineteen times and seven cases developed. Less success was obtained with measles but the number of infections from this disease was greatly reduced.

The experiences of Grancher and a few other investigators who confirmed his results paved the way for the celebrated Pasteur Hospital. This hospital for 120 patients, housed in two two-story pavilions, was completed in 1900. Each floor is provided with a large proportion of rooms for single patients, the partition between each pair of rooms being of glass and each alternate partition of lath and plaster. The partition on the central corridor side is glazed in all the rooms. The objects of this glass area are to permit easy observation of the patients and to make the patients contented in separate rooms. At the end of each floor is a larger convalescent ward for twelve patients, subdivided by partial partitions into two parts. Transverse open-air corridors are a part of the construction. On both sides of the building are narrow open-air balconies upon which most of the rooms open. These balconies serve two purposes: visitors may see patients through the windows, and any room or group of rooms can be shut off from the central corridor by utilizing the outside balcony for communication. The anterior construction provides for thorough and ready cleaning, without damage, by soap and water or disinfectants. The tile flooring is carried up the walls for a distance above which the walls are of plaster. The rooms for patients are provided with lavatories and a sink for washing utensils with hot water. The utility rooms are furnished with sterilizers. The dressing tables and bathtubs are on wheels. Great pains have been taken to provide every means for carrying out a rigid "antiseptis." During the fifteen years of service, all kinds of infectious diseases, including smallpox and typhus fever, have been treated in this hospital with a cross infection amounting to a fraction of 1 per cent.

Aseptic nursing soon found its way into England and is being used in many hospitals for contagious diseases, fever hospitals, they are called. The Plaistow Hospital, South Western Hospital, North Eastern Hospital, and Eastern Hospital, London, the City Hospital, Liverpool, and the Monsall Hospital, Manchester, are some of the institutions which have adopted aseptic nursing.

It is true that disease organisms have been recovered from floors, walls, dust, furniture, and elsewhere in rooms occupied by contagious disease patients. Yet the practical experience of the hospitals already mentioned clearly points out two facts: first, that the atmosphere, either still or in motion, rarely if ever conveys such disease germs from one patient to another; secondly, that contact transmission of such infecting organisms may be obviated by the employment of rigid asepsis. If, however, transmission should actually occur, practical experience teaches that it is of small importance in producing disease in others, either because the organisms are too few in number or in a

non-virulent state. These are the facts which those who deal with contagious diseases ought to be assured of. It can be stated as a general principle that disease organisms, after leaving the body, rapidly lose their virulence, particularly under conditions of sunlight and drying. With the exception of certain spore-bearing bacilli, organisms must, to survive, live under very favorable conditions, as in water or milk. The infecting agent has been discovered for only a part of the infectious diseases. Judging, however, from what has been learned about typhoid fever, diphtheria, and a few other diseases, the infecting agent does not emanate from the entire body of the patient but escapes in certain definite secretions and excretions. The first step in prevention is, therefore, that these discharges be promptly collected, and either sterilized or so disposed of that no one can be exposed to them by direct or by indirect contact. It must always be remembered that fresh discharges are the most virulent.

In the following diseases the way in which the infecting agent escapes from the body may be definitely stated. *Scarlet fever*: in the secretions of the nose and throat and aural and nasal discharges, desquamation in itself is harmless. *Diphtheria*: in the secretions of the nose and throat and nasal and aural discharges. *Measles*: in the nasal and throat secretions. *Chickenpox*: in the nasal and throat secretions and possibly in the skin lesions. *Smallpox*: in the nasal and throat secretions and the late skin lesions. *Whooping cough*: in the nasal and throat secretions and especially in the bronchial secretion coughed up after a paroxysm. *Mumps*: in the buccal, throat, and nasal secretions. *Typhus fever*: in the blood of the patient which has been extracted by the body or head louse. *Cerebro-spinal meningitis*: in the nasal secretions. *Anterior poliomyelitis*: in the nasal and throat secretions and possibly in the intestinal contents. These examples are sufficient to show that we have definite facts with which to combat the diseases mentioned, never forgetting that it is the fresh discharges which are the most highly infectious.

Supplementing the successful experiments already carried out in France and England, continued experience with infectious disease impels one to doubt the aerial transmission of disease. Although experiments have often been made to determine the presence of disease-producing bacteria in the air, and with more or less success, it is obvious that the organisms so recovered have been very few in number. Theoretically, from such experiments, we should have to reckon with air as a possible source of infection; practically, however, it is of small significance. Exception is made of possible infection when a child coughs in one's face at close range, expelling visible particles of secre-

tion. The determining factors in the production of disease are the number of organisms ingested, the virulence of these organisms, and the immunity of the patient. The dosage is of considerable importance and may explain the inconsistency between laboratory results in recovering bacteria from the air and the fact learned from hospital experience that such infection is uncommon if ever possible except at close range.

The problem of controlling infection resolves itself, then, into measures for preventing the transference of secretion or excretion from the sick to the well, either by direct or indirect contact. Lord Lister taught surgeons that clean operative wounds were possible by employing "antisepsis." The asepsis of today is Lister's "antisepsis" without the antiseptic spray to sterilize the air. Asepsis will do for the medical care of patients suffering from infectious disease what it has done for surgery.

In addition to asepsis, there are two other important principles in the successful care of infectious disease in a hospital. The first of these is the proper admission and supervision of patients. Exact diagnosis is difficult and impossible in a certain percentage of cases. These mild, unrecognized cases are one of the most important sources of disease in any community and particularly in a general hospital. The admitting officer should realize this fact and isolate all doubtful cases. Many cases are carriers of disease other than that for which they are admitted; in the case of diphtheria, carriers can be detected by taking cultures at the time of admission; vaginal smears should also be taken to guard against gonorrheal vaginitis. Carriers of other diseases may escape detection. Another problem is the possibility of admitting cases which are incubating a secondary disease. Inquiry should be made at the home as to whether the patient has been recently exposed to any other disease, at home or elsewhere. If all new patients are isolated alone or at most with one or two other new cases during a detention period, the second disease may show up and infection of other patients be prevented or greatly limited. As a general rule there should be no large wards in an infectious hospital; that is, none to hold over eight or ten patients. Supervision of patients should be keen and unremitting, in order to detect at the earliest moment the onset of secondary disease. Prompt isolation will save much trouble. The supervision should be not confined to patients but should include the hospital personnel, particularly nurses and others who come into intimate relation with the patients: all acute illness among employees should be cause for removal from duty until the diagnosis has been made. Hospital employees should have cultures taken when they are engaged and at intervals afterwards: they should also be successfully vaccinated.

The second important principle in the administration of a hospital for contagious diseases is the distribution of patients or methods used to prevent patients with different diseases from mingling. Since the beginning of aseptic nursing, two methods have evolved for the isolation of patients, the cubicle system and the barrier system. The cubicle method is to put patients into rooms designed for single patients. These rooms may be arranged on both sides of a central corridor, on one side of a corridor, or the approach may be from an out-door veranda. In one or two English hospitals, a double tier of rooms with glass partitions are approached only from a veranda on each side of the building. The glass partition allows the nurse to observe all her patients, but the patients cannot come together without going out on the veranda and entering the other doors. In some hospitals, the partitions are not complete. In England, old wards have been cut up into several rooms leading into a central corridor and the partitions are about seven feet high. Whatever the construction, the object in view is to make it difficult for patients to mingle.

The second system of isolation is the barrier system and really developed out of Grancher's experiments. This method aims to isolate patients in the same room with other patients suffering from other diseases. In Grancher's wards, the bed of a barriered patient was surrounded by a wire screen. In England, the first barrier tried was sheets kept wet with bichloride of mercury; it was soon learned that these were unnecessary and the beds are designated by a piece of colored tape. At Providence City Hospital, we employ a card which hangs, in a card holder, on the patient's bed.

Any method of separation must be supplemented by vigilant supervision of patients by the nurses on duty. Each patient or group of patients suffering from the same disease may be said to be treated in a unit. Hands, utensils, linen, and so forth must be sterilized efficiently and faithfully when passing from one unit to another for otherwise they may carry fresh and virulent secretions.

In March, 1910, aseptic nursing was first undertaken at the Providence City Hospital. Charles V. Chapin, Superintendent of Health of Providence, had visited, several years previously, some of the hospitals already referred to, and was able to have the City Hospital constructed in accordance with theories of medical asepsis. To him belongs the credit of this venture, a venture which, it is hoped, may come to mean much to the infectious hospitals in America. I wish to outline, in the following pages, the construction, the management, and the results attained between March 1, 1910, and January 1, 1915.

Patients suffering from infectious diseases are accommodated in

three two-story pavilions, arranged parallelly, and containing about 140 beds. Two of the buildings are duplicates; each floor of these pavilions is so arranged that about half of the patients can be placed in rooms off a central corridor and containing from one to three beds apiece. The main ward of fourteen beds is across the south end of the building. At the present time, one of the duplicate buildings is devoted to scarlet fever. The first floor of the other building houses the diphtheria patients; the second floor is used for an isolation ward where various infectious diseases, except measles and chickenpox, are treated. These highly transmissible diseases are not included because the nursing in these buildings is largely done by pupil nurses who have only a two months' training in the technique. The third building, the so-called Isolation Building, provides for the care of any infectious disease, including smallpox. On the first floor are twelve rooms containing one bed each, and on the second floor are rooms containing from one to three beds.

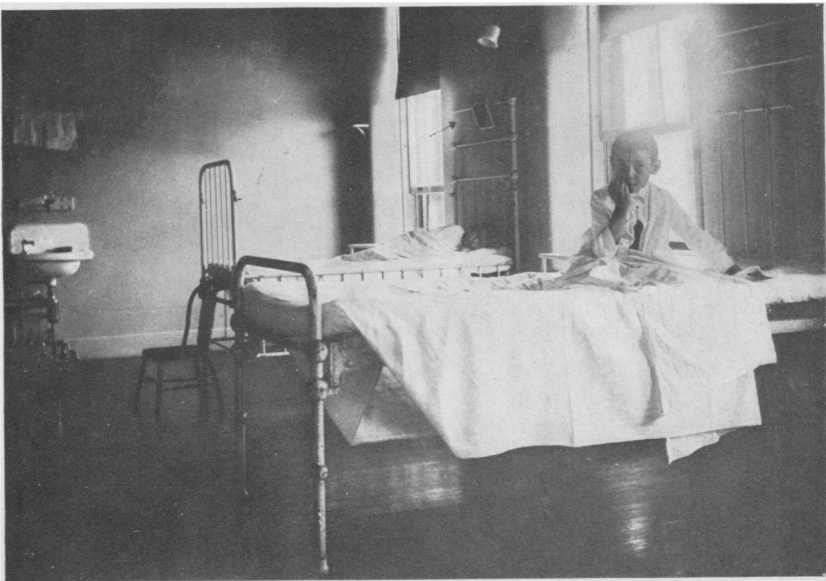
All the wards are provided with utility rooms and there is an operating room on the ground floor of each building. Each room occupied by patients is provided with a lavatory where the water must be turned on by forearm or foot levers and where nurses and physicians must wash contaminated hands in running water with soap and scrub brush; immersion in antiseptic solution is also required after such diseases as measles, chickenpox, smallpox, and very septic cases of other infectious diseases. With the exception of certain toilet rooms for convalescents, it is the purpose of the management to confine all infection to the rooms occupied by patients and whatever leaves these rooms must be properly cleaned or sterilized. Patients go through uninfected portions of the ward only under supervision to avoid their touching anything and so possibly infecting it. This is a very rigid rule.

Utility rooms are equipped with sterilizers and infected linen is thrown into a chute through which it drops into a canvas bag in the basement. These bags are collected and delivered to the laundry under aseptic precautions. In the basement of each building is a locker and wash room for nurses. When off duty, all nurses live in the same dormitory and eat in the same dining room; they are at liberty to leave the hospital with as much freedom as in any general hospital, no precautions being observed other than the technique followed when leaving the ward; namely, changing uniforms, and washing hands and face.

One kitchen does all the cooking and one laundry washes all the linen.

Elaborate construction alone is quite unable to prevent cross infection. Proper management is of far greater importance. The latter

resolves itself into proper admission of patients to prevent mistakes of diagnosis, active and intelligent observation of patients for symptoms of secondary disease, careful attention to the health of all employees, absolute separation of patients suffering from different diseases, and the proper and efficient sterilization of hands, utensils, and linen between different infectious units. Be assured that such work should be undertaken only by those who have had systematic and intelligent training. Nurses with old ideas of infection must shed them and learn to look at all points of contact to see that no infection gets by any barrier.



"BARRIERED" CASE

The City Hospital accepts for treatment a large variety of infectious diseases, including scarlet fever, diphtheria, measles, chickenpox, smallpox, mumps, gonorrheal conditions in children, syphilis, tuberculosis, erysipelas, whooping cough, typhus fever, trachoma, and so forth. It is therefore very important that all cases be promptly examined and the diagnosis must be as accurate as possible. Those who see contagious patients in large numbers appreciate the difficulty of diagnosing mild cases. At the City Hospital, we take no chances and doubtful cases are properly isolated until such time as the diagnosis is clear. All new cases are kept, for a week's observation, in detention rooms containing not more than three beds. In many cases this provides

opportunity for diagnosis, for obtaining cultures, smears, and so forth; and if patients are in the incubation period of some other disease which has a short incubation period, they may develop symptoms before they are placed with other convalescents.



CUBICLE ISOLATION WARD

Once the patient has been admitted, he must be under the most watchful care of physicians and nurses to detect the earliest sign of onset of any secondary disease. Nurses are instructed to barrier all suspicious cases and notify, at once, the physician on that ward. A careful history of exposure to secondary infection at home is obtained by the ambulance attendant.

When the patient has been admitted to the proper unit, the avoidance of transmitting infection from one unit to another devolves largely upon the nursing force. They must be taught the underlying principle of asepsis and the details of its administration. The wards are each in charge of a trained graduate nurse and in wards E and F, where the most highly transmissible diseases are treated, only graduate nurses are employed. Occasionally this rule is broken when we detail to these wards pupil nurses who, in the opinion of the superintendent of nurses, are especially intelligent and trustworthy. The remainder of the nursing work is performed by pupils who come from general hospitals for a two months' training in infectious diseases.

Omitting many comparatively unimportant details, I should like to point out certain interesting features. Nurses are taught that the room occupied by a patient is an infected area and, under no condition, shall she touch or allow any portion of her clothing to touch anything in such a room. Everything that leaves such a room must be properly sterilized. The nurse herself must scrub her hands thoroughly when leaving the room. She wears short sleeves but puts on a gown only when coming into intimate contact with the patient. She must see that patients in different units never come into direct or indirect contact.

All this elaborate technique must be supplemented by careful supervision of the nurses themselves, lest a sick nurse be on duty to the possibly serious menacing of the patients for whom she is caring; it is also for her own interest to be taken off duty at once until the diagnosis has been established. The same supervision applies to all the hospital personnel. Physicians, nurses, and help must be vaccinated and must have cultures taken when entering upon their duties.

Resident physicians wear white suits and, over their shirts, a short-sleeved, washable vest, outside of which is worn the usual white coat. On visiting patients, the coat is removed and a gown is worn only when making careful physical examination when intimate contact of the doctor's clothing and the patient or bed is unavoidable. The doctor never allows anything in an infected room to touch his clothing and always scrubs his hands between units.

The general administration of the hospital is, in detail, complex, but the general principles may be summed up as follows. Those who have duties which take them to the wards temporarily and who visit only the uninfected portions, need not take any precautions. Food and other supplies are so delivered to the wards that few receptacles have to be interchanged. Infected linen is collected under aseptic precautions by a reliable man and placed directly into washers when it is washed with boiling water and is certainly rendered sterile. No sterilizing washers are used.

Patients are brought to the hospital either in a town car or an ambulance, depending on the severity of the illness. The same aseptic precautions are taken so that it is safe to send the same vehicle for a case of scarlet fever and immediately afterwards for a case of measles. In five years, 3746 patients have been transported to the hospital and I am satisfied that no patient has contracted any disease from the ambulances.

Before discharge, the patient receives a thorough soap-and-water bath including shampoo, and clean clothing is provided. After discharge, the bed linen is sent to the laundry; the mattresses and pillows are either sterilized or thoroughly aired; all utensils used upon the patient are properly sterilized; bed and bedside table are washed with soap and water. If the patient has occupied a room by himself, and particularly after certain infectious diseases, not only the furniture but also the floor, walls, and fixtures are washed in soap and water. No fumigation is ever done.

It may be of interest to review the results obtained in the City Hospital during the five years between March 1, 1910, and January 1, 1915. During this period, 4914 patients have been treated in the hospital. Both the barrier and cubicle systems have been employed; three diseases are not isolated by the barrier system, namely, measles, chickenpox, and smallpox.

In estimating our success or failure in this work, I mean to point out the number of patients who have contracted a secondary disease and the number of employees who have contracted infectious diseases from patients. It will be necessary first to subtract 1204 adult patients treated for tuberculosis and for syphilis from the total (4914), leaving a total of 3710, practically all of whom were children. Of this number, 121 developed a secondary infection which was probably contracted in the hospital. This is an incidence of 3.2 per cent. The cross infections were distributed as follows:

Chickenpox.....	52
Diphtheria.....	4
Measles.....	35
Mumps.....	3
Rubella.....	4
Scarlet fever.....	19
Whooping cough.....	4
<hr/>	
Total.....	121

It will be evident that nearly one-half were cases of chickenpox, one-third were measles, and that chickenpox and measles together

amounted to eighty-seven cases, or three-fourths of the total. Only sixty-four cross infections took place in the isolation wards.

In the five years, thirty-three employees contracted an infectious disease. Twenty-four, or over three-fourths, were pupil nurses.¹ The diseases contracted were scarlet fever or diphtheria, with these exceptions: four cases of mumps and one of rubella. The incidence of infectious diseases among employees was, in 1913, 6.7 per cent and, in 1914, 4.2 per cent.

I know of no way absolutely to prevent cross infections in hospitals. Our limitations in recognizing at the first moment the exact diagnosis make this impossible, so long as we allow two or more children to associate during hospital residence. From the results already reported it would appear:

(1) That patients suffering from different diseases need not be housed in separate pavilions, inasmuch as atmospheric contagion is rare.

(2) That proper disposition and rigid asepsis will accomplish for patients suffering from the usual contagious diseases what surgical asepsis has done for surgery.

IN GLEIWITZ

UNIT I, AMERICAN RED CROSS, AT WORK

BY DONNA G. BURGAR, R.N.

We arrived in Gleiwitz at one o'clock, noon, and went at once to the Garrison Lazarett, in carriages, each nurse with suit case and duffel-bag under her immediate supervision. There we were graciously received by the commanding surgeon and captain of the garrison. German was spoken, and both were delighted that so many of the nurses spoke the language of the country. The supervisor of the Unit acted as interpreter for the American Director and a conference was arranged for the same afternoon, to make plans for our coming work. We drove from the reception to the *Deutsches Haus*, which proved to be our home for the next few days, until our permanent living quarters were provided. Certainly all arrangements were expeditiously made, for immediately after luncheon came the conference, the trip to the *lazarett*s (military hospitals) which could be assigned to us, then the evening meal, to bed early, and to work the next morning at half-past seven.

¹ Seventy or eighty pupil nurses are received each year for training.